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ABSTRACT

This paper discusses the cultural-historical school founded by Vygotsky, Luria, and Leontiev as the theoretical background of Russian educational psychologists who have been studying how children learn to reflect. Two approaches to reflection are examined within the cultural-historical tradition: first, reflection--like other higher psychological functions--is formed in socio-cultural practice (interaction); and second, according to Vygotsky, "scientific concepts" are by their very nature reflective, while the way in which the concepts themselves are formed must invoke reflection. The paper then discusses three groups of empirical studies conducted by Russian researchers in the field of reflection: the first consists of those which conform to the cultural-historical theory and which are closely related to Dawydov's elaboration of this theory; the next group is interested in particular in the relationship between "personal" and "intellectual" reflection within the framework of problem solving; and the third group sees a connection between reflection and attribution (self-evaluation). These studies furthermore investigate how reflection evolves from interaction. The paper's concluding section classifies these studies and describes what educational practice can learn from the research on learning to reflect. Contains 55 references (Author/AA)

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Reflection in Russian Educational Psychology

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Abstract

For many years now Russian educational psychologists have been studying how children learn to reflect. The present article describes the theory on which the majority of these researchers have based their work, i.e. the cultural-historical school founded by Vygotsky, Luria and Leont'ev. There are two approaches to reflection within the cultural-historical tradition. First, reflection -- like other higher psychological functions -- is formed in socio-cultural practice (interaction). Second, according to Vygotsky "scientific concepts" are by their very nature reflective, while the way in which the concepts themselves are formed must invoke reflection.

The article discusses the work of three different research groups. The work of the first is dominated by Dawydov's theory; the next group is interested in particular in the relationship between "personal" and "intellectual" reflection within the framework of problem-solving; and the third group sees a connection between reflection and attribution (self-evaluation).

The concluding section classifies these studies and describes what educational practice can learn from the research on learning to reflect.

Reflection in Russian Educational Psychology

Throughout the eighties, and no doubt even today, Russian researchers organized annual conferences devoted to the theme of reflection. In an account of the 1984 conference, Ogurcov (1986) reports on the discussions which took place in the various conference sections covering the following themes: (1) reflection in scientific thinking, in particular the relationship between reflection and theoretical thinking; (2) the basic functions of reflection; (3) the use of linguistic means, the evolution of "reflective languages" and semiotic means of reflection; (4) reflection in communication, in particular in specific domains (physics, architecture); (5) reflection as a "collective" (interactive) activity; (6) reflection in learning, particularly in relation to devising assessment and solution plans.

It is clear that Russian scientists are highly interested in reflection as a psychological phenomenon. In their survey of Russian research on reflection, Stepanov and Semenov (1985) divided the various studies into the following categories: (1) research on "cooperative" reflection, for example at work or while playing sports; (2) research on "communicative" reflection from a socio-psychological perspective; (3) research on "personal" reflection, in particular in processes in which one's own actions are supposed to be meaningful; (4) research on "intellectual" reflection, the research framework here is the analysis of cognitive processes.

Ogurcov's (1986) classification largely agrees with that of Stepanov and Semenov (1985), but these are of course general types.

The present article explores the theoretical underpinnings upon which Russian psychologists base their analysis of reflection. The intention is to arrive at a clearer understanding of their research aims and research methods, and to explore the relevance of their research to educational practice. The discussion is largely restricted to those studies which are significant for education and educational psychology. The reader will no doubt notice that most of the sources cited in the article date from the seventies and eighties. That is because after 1990, scarcely any articles on the subject in question appeared in the most authoritative journals (such as Voprosy Psichologii), with the exception of a publication by Slobodcikov and Cukerman (1990).

For many years now the English-language literature has devoted a great deal of attention to a closely related theme: metacognition (see among others Kirby, 1984; Lawson, 1984; Sternberg & Wagner, 1994, Kilpatrick, 1985; Yussen, 1985). A comparison with Russian research would naturally be very interesting, but requires a separate, in-depth study. That has not been the intention here.

Epistemological Background

The most important theoretical source of inspiration for the majority of research on reflection is Vygotsky, Luria and Leont'ev's cultural-historical theory. In turn, they, the founders of a school of the same name, based their work on the epistemology of Kant, Hegel and Marx.

According to Kant (1781/1965), any consideration of how we

come by real knowledge must focus in on an analysis of our cognitive faculty. Knowledge cannot come from sensory input alone. There must also be certain preexisting categories according to which this sensory material is ordered and organized. He believes that such categories as causality, quality and substance and the two forms of sensory intuition, space and time, are not features of external reality, but approximations of the human spirit. These categories are a priori, built into the nervous system. In a formal sense, the source of knowledge lies in the human faculty of cognition, and we must therefore learn how that faculty works. What Kant means is that humans must analyze their own cognitive operations, i.e. reflect upon them. Hegel (1807/1952) also believes that (theoretical) thought does not focus on objects alone, but also on the process of thinking. Self-knowledge -- knowing how we analyze, structure -- implies knowing one's own thought activities, and that is what we call reflection. For Hegel, who distinguishes five different definitions of reflection (Van Dooren, 1965), this self-knowledge, this "inner play of forces", is essential. One of Marx's famous pronouncements, according to Lektorsky (1984) is that humans, unlike animals, can design their own actions, which means that they must consistently subject their mental activity to reflection. Following Marx, Lektorsky (1984) argues that reflection would not be possible without knowledge, and that humans <u>share</u> such knowledge with others, for example at work. Lektorsky believes that reflection evolves from inter-human activity, from dialogue -- a view which is very close to Vygotsky's.

Zak (1977), a close colleague of Dawydov and leading researcher on reflection, agrees with the "dialectical logic" of Hegel and Marx which distinguishes two types of thinking: the empirical and the theoretical. With theoretical thinking, humans investigate the world by analyzing the "internal connections" (see Il'enkov, 1977). In dialectical logic, the relationship between material and ideal (Il'enkov, 1983) and between concrete and abstract is given a specific interpretation. The idea that the abstract consists of the most formal and general representation of an object from which all concrete aspects have been removed is contradicted in dialectical logic. Confrey (1991) describes this position as an "excellent critique and rejection of positivist and behaviorist approaches to concepts" (p. 29). The abstract reflects the essence of substance from which concrete aspects have not been eliminated.

Reflection in Cultural-Historical Theory

Cultural-historical theory hardly requires an introduction nowadays; it has become well known in the West thanks to publications by Newman, Griffin and Cole (1989), Wertsch (1985), Daniels (1993), Bruner (1986), Cobb (1994), and Rogoff (1990). It may be assumed, hence, that readers are generally familiar with the broad outlines of the theory, so that we can restrict ourselves to a short description relevant for our purposes.

Cultural-historical theory views humans as active and not re-active creatures whose actions are both effective and meaningful. To be able to act, children must develop higher psychological functions. Following in the footsteps of Marx and

Hegel, Vygotsky explains the development of these functions by looking at the historical and social development of humankind (phylogenesis). As a young child grows up, the higher psychological functions first evolve as social functions and then become individual functions. Language begins as a means of communication which is subsequently internalized to become an individual function. Action is one of the key concepts in Vygotsky's theory. Activity, the action of human beings, is seen as meaningful, layered (material, motoric, mental), with various different functions (orientation, execution or operation and monitoring, Gal'perin, 1980), and as both spontaneous and systematic. Van Oers (1990) summarized this theory as "cultural-historical action psychology."

The concept of reflection forms an element of Vygotsky's work in two different ways. According to him, higher psychological functions evolve from inter-personal activity. One of these higher psychological functions, reflection, hence evolves from participation in socio-cultural practices, a process which unfolds in the following way. In dialogues, humans are confronted with criticisms of their own ideas and work methods. Anticipating the comments of another can lead to a critical dialogue with oneself. In essence, reflection is internalized dialogue. Reflection is stimulated in interactive teaching. Various studies (Nelissen, 1987; Nelissen & Tomic, 1993) have shown that interactive mathematics teaching leads to a higher level of reflection in children. Comparable results were achieved in research conducted by Matis (1982) and Malzewa (1974).

Vygotsky explains the evolution of reflection in yet another

way, which he relates to the nature of so-called scientific concepts and the characteristic way in which these concepts are constructed. Wertsch (1985) believes that Vygotsky has borrowed the concept of reflection from Lenin[1] i.e. that it does not mean precisely the same as "self-consciousness." It is not entirely clear whether Wertsch is referring to Lenin's "mirroring" concept (in Russian "izobrazenye") or to reflection (in Russian "refleksya"). Whatever the case, Wertsch (1985) points out that according to Vygotsky, reflection is an essential part of the way scientific concepts are constructed, in particular because these concepts are intentional and reflective. Everyday concepts, on the other hand, arise spontaneously, are hence used randomly, are not intentional and systematic and provide only a weak basis for generalization. Initially young children represent the world in terms of these everyday concepts. Vygotsky distinguishes "syncretic images", the simplest of all representations, and pseudo-concepts or complexes. These develop later, usually randomly (all animals with four legs are cats). Scientific concepts, on the other hand, evolve through interaction with adults. They are more general, fit nicely into a system, are connected to other concepts, and are instruments for analysis. Vygotsky (1964) put it this way: "Also tritt das Bewusztwerden durch das Tor der wisssenschaftlichen Begriffe ein" (p. 206) [Scientific concepts are the gateway to consciousness]. Everyday concepts evolve from daily experiences and observations; they are static, unlike scientific concepts which are dynamic and characterized by "internal movement" (in the words of Marx as quoted in Zak, 1977). Piaget's (1977) distinction between

"abstraction empirique" and "abstraction réfléchissante" essentially comes down to the same thing. The empirical concepts evolve from interaction with objects: "tire ses informations des objects comme tels ou des actions du sujet" (p. 303). The reflective concepts (abstractions) evolve whenever coordination systematically takes place on a higher plain ("paliers successive") each time.

Because of the way in which scientific concepts and scientific thought take shape, a deeper knowledge of reality evolves. In scientific or theoretical concepts (Dawydov, 1972), the "dialectical relationship" between reality -- as it appears to us -- and the essence embedded in it becomes manifest. The concepts are reflective in nature, and using and learning to use them leads to discussion and reflection. This way of thinking requires reflection on the thought processes being utilized, unlike empirical conceptualization, which is based on observable and formal principles of classification according to the rules of "formal logic." Dawydov (1972) and Zak (1977) believe that children must learn to think theoretically, i.e. learn to analyze and understand reality through theoretical (mathematical, linguistic, and so on) insights or generalizations.

Research

This section discusses empirical studies conducted by Russian researchers in the field of reflection. The studies have been divided into three categories. The first consists of those which conform to the cultural-historical theory and which are closely related to Dawydov's (1977) elaboration of this theory. The second encompasses those which also conform to the cultural-

historical theory, but which emphasize personality traits. The third covers those in the cultural-historical tradition which attempt to identify a relationship between reflection and attribution, self-evaluation, self-monitoring and self-criticism. These studies furthermore investigate how reflection evolves from interaction.

Studies based on Dawydov's theory: theoretical thinking and reflection

As discussed above, Dawydov (1977) elaborating on Vygotsky's distinction between everyday and scientific concepts, distinguishes between theoretical and empirical concepts and between theoretical and empirical thinking. According to Dawydov, empirical thinking has had a major impact on present-day educational practice. This impact is most evident in the idea that learning processes proceed from the "observable," i.e. from direct experience, to the "abstract." This idea is frequently represented in the following way: sensory-concrete experience--> iconic representation--> abstraction. As shown, the concrete-observable is the basis for concept formation. Dawydov (1977) counters this by proposing that conceptualization also comes about, and comes about more effectively, well established ideas (ideal models which can be seen as propositional representations) are used to understand reality. Reflection is inextricably bound up with such theoretical thought processes.

The difference between empirical and theoretical conceptualization has given rise to other comments. Govorkova (1975), for example, believes that the distinction is much too absolute, because empirical thought is also frequently

theoretically charged. She points in this connection to the conceptual character of empirical thought.

Zak (1976, 1977, 1984), who explores reflection from the same perspective, defines reflection as the consideration of the way in which knowledge is created and the evaluation of the results of knowledge. In other words, through reflection people gain insight into the way in which, and the conditions under which, concepts evolve and are constructed.

Zak's ideas on reflection (Zak, personal communication, March 7, 1979) are shown in the following simple diagram (Figure 1).

INSERT FIGURE 1 ABOUT HERE

Humans are capable of analyzing the phenomena around them and of reconstructing them based on theoretical thinking. They can, moreover, think about the methods of reconstruction. That is what Zak (1984) calls reflection.

The first experiment in which Zak (1980) explored the connection between theoretical thought and reflection had the following design. The experimental materials consisted of a set of cardboard strips varying from 2 to 25 cm in length, with 25 different lengths in all. There were strips measuring 2, 4, 6, 8 and so on to 24 cm in three different boxes. There was also a box with large strips measuring 26 to 50 cm.

The children (54 in all, around 7 years of age) were asked to piece together a big strip from a number of smaller ones. The children were asked to assemble 12 such strips. Thirty-nine of the children in the group did the following; they immediately

chose random strips of varying lengths and kept trying until they had found another strip of the same length. When asked what they had done, they replied that they had taken the strips from the box and laid them next to one another. They were unable to formulate a (general) solution principle, focusing instead on serendipitous facts, each of which was considered independently of the rest.

The remaining 15 children used an entirely different approach. They did not select strips until they had "measured" the model with their eyes (or their fingers). They then estimated the number of strips of approximately the same length that they would need, chose these, and added a smaller strip. These children used an estimation strategy as the basis for a plan (pre-task reflection) and found a solution strategy which they could use for each of the problems they had been set (strips of equal length + 1). Afterwards they were able to analyze this general method. Zak (1980) concludes that the use of a general, theoretical solution method is linked to reflection. In a follow-up experiment, he investigated whether and in which way the transition from empirical to theoretical solutions can be encouraged. A large majority of the children (80%) were capable of making this transition after they had been actively shown how to measure the strips by means of diagrams. These children were then able to conceive theoretical solution plans without teacher assistance and were able to reflect on this process. The empirical thinkers got no further than saying that they had manipulated randomly chosen strips (trail-and-error method).

Zak's (1980) experiments confirm the results of research

conducted by Gurova (1959) in the fifties. She discovered that children who did not understand the mathematical structure of a problem and were not able to analyze it, were equally unable to reproduce the work method which they were attempting to use.

In another experiment conducted by Zak (1976), children were given four problems:

1. B, C, A, N ------- N, A, C, B

2. 5, 2, 3, 7 ------- 3, 7, 5, 2

3. K, R, T, P ------- T, P, K, R

4. 4, 8, 9, 1 ------- 1, 9, 8, 4

The children were asked to change the order of sequence on the left so that it was the same as the order of sequence on the right. They were asked to do so in just two steps by switching two letters or two numbers. During the first part of the experiment, the children (7-10 yrs.) solved the problems, and in the second they were asked which two problems resembled each other. They were asked to classify the problems, thus. Some of the children grouped problems 1 and 3, and problems 2 and 4 together -- a formal classification which had nothing whatsoever to do with the mental activity which they had had to perform. These children only looked at letters versus numbers. Another group, however, grouped 1 and 4 together and then 2 and 3. Zak (1976) calls this a classification concerning contents because the children had looked at the solution method. Since such a classification is only possible when one is able to analyze one's thinking about one's own actions, Zak (1976) concluded that these children were capable of reflection.

In a similar experiment (Zak, 1982), the researcher reports

the following. As in the foregoing, the children were asked to change the order of sequence on the left to resemble that on the right in two steps.

1. RPWK ----- PRKW

2. GMBF ----- BFGM

3. SLCZ ----- LSZC

After the children had solved the problems, they were once again asked to indicate which problems resembled each other: they might all be the same, they might all three be different, the first and the second might resemble each other, etc. Seventy percent of the experimental school children solved all three problems. This school had introduced a new mathematics program based on Dawydov's theory. Only 40% of the children from the control school were able to solve the problems (traditional program). Not only did the children from the experimental school do better in solving the problems, but moreover, they had learned to reflect; 58% of them classified the problems based on an analysis of the solution methods applied. Only 21% of the control children classified the problems on the same grounds.

In another experiment, Zak (1984) used the following problem types. 1. In 18 years Ivanov will be 13 years older than Boris is now. Who is older? 2. In 12 years Vladimir will be 17 years older than Gordeyev is now. Who is older? 3. In 16 years Danilov will be 11 years older than Egorov is now. Who is older? The children were once again asked to solve the problems first and then classify them. Zak (1984) observed that some of the children guessed at the answers or could not solve them (especially number 2). Other children gave the correct solutions and indicated that

problems 1 and 3 belonged together. They did so based on the action they performed to solve the problem, leading Zak (1984) to believe that they were capable of reflecting.

One point to be considered with respect to Zak's work is that he draws a very direct line between reflection and theoretical thinking. That would mean that young children who are incapable of theoretical thinking would also be incapable of reflection. It is precisely in young children (4 to 5 years old) that other researchers (Podd'jakov, 1980; Freudenthal, 1979, 1991) have observed the preliminary phases of reflection. Podd'jakov (1980) investigated the evolution of self-regulation in young children in great detail. He determined that toddlers, experimenting with material, adjusted their action and set new goals based on representations of objects and situations (iconic representations). This was by no means intentionally planned reflection, of course, but reflection of a spontaneous sort related to play.

Another researcher who was a member of Dawydov's research team is Ajdarova. Unlike Zak, however, she did not study reflection directly, but made the learning of reflection an essential element of a large-scale educational experiment on the mother tongue (Russian). The experiment can be seen as a development educational study. Ajdarova intended to investigate how children master theoretical concepts (the relationship between the message's form and its contents) and how they acquire an understanding of their own learning activity -- i.e. whether or not they reflect (Ajdarova, Gorskaja & Cukerman, 1983). The children were asked what people study. There were many possible

answers: the sun, the sea, the weather, animals. The suggestion was raised that people can study their own language too. The children found this amusing at first; language is something you use every day, all day long. Nevertheless, they discovered that one can indeed study one's own language. They learned to construct schematic representations for concrete phenomena (everyday language). There is always someone who says something (the sender) and someone who listens (the receiver), and there is a message. The children were allowed to construct their own symbols for all of these dimensions. They then discovered that the message has both form and content, which the researchers presented in the following way: imagine that we live in pre-historic times; language and writing haven't been invented yet. How would you let me know that fire has broken out and we are in danger? The children discovered that they could do this in various ways. They were then asked to pretend that someone had just reported the death of the tribal chief to them. How would the chief's mother, a jealous clan member, or the tribal priest react to this message? The children discovered that while the message may have one meaning, it can be interpreted in various ways (sense). Their ability to reflect was stimulated in two different ways. Firstly, they were asked to construct diagrams representing situations and engaged in consultations about these diagrams: which diagram shows the situation best, how can it be used for another situation, does it have to be extended to express more specific meanings? The children reflected constantly on their own constructions. Second, reflection was elicited through dramatization in the following way. The children were

allowed to design masks for various characters in a play. At the same time they created symbols which stood for the meaning (content) and the form of the message (see Figure 2).

INSERT FIGURE 2 ABOUT HERE

Some children were actors, others wrote the scenario and a third group were the audience. The latter group was to decide whether the meanings were clear, in other words whether the play went according to the scenario. The roles changed each time. The children who were actors in the first round wrote the scenario in the second, and so on. By changing roles, the children learned how to look at the play through a different person's eyes each time; more importantly, they learned to look at their own work methods through another person's eyes (a different role).

It should be noted that the children were given ample opportunity to make their own constructions; they created their own diagrams, symbols, plays; they evaluated the design, and the result. The teacher was often merely an observer in the background. The researchers concluded that the children were able to analyze concrete situations on the basis of a general notion (a theoretical concept), supporting Dawydov's theory. Theoretical thinking, which was focused on constructing diagrams, led to constant discussion and reflection, partly through the channel of dramatization. The researchers continued their program in the fields of morphology, spelling and poetry (Ajdarova & Cukerman, 1977).

It is interesting to note in passing that language and reflection are connected with one another in yet another way, as

Llublinskaya (1956) demonstrated in an experiment. She observed that language, in particular metaphorical concepts (Llublinskaya refers to "epitheton"), is used as an instrument of reflection to evaluate the quality of an iconic representation (picture or "image"). In this case reflection consisted of analyzing an iconic representation based on a metaphor (a horse is a bruiser), thereby increasing the quality and detail of the representation. The experiment showed that language is a tool which can be used to reflect on the representation of an object.

The next researcher whose work is closely allied to Dawydov's theory is Doblaev. In the epilogue to his publication (Doblaev, 1984), Dawydov emphasizes that the importance of Doblaev's research lies in his drawing the attention of the children to the structure of the meaning of a text (which can be interpreted as a theoretical concept). That is important because children are often inclined to concentrate on coincidences or trivialities in a text. Doblaev (1984) did not study reflection as such, but -- like Ajdarova -- conducted a development educational study in which he investigated how children might learn to formulate questions about a text on their own, something Dawydov considers a form of self-monitoring and hence reflection. During his long-term study, Doblaev (1984) conducted a number of training courses on which he reported in detail, making use in some instances of protocol material. He conducted training sessions with 24 children aged 16, 14 and 12. This training was split into three stages. In total the children were asked to solve 2500 problem situations. In the first stage, the child was shown a portion of text which contained one problem situation.

The researcher posed (hidden) questions on this text, in this way familiarizing the child with the basic strategy, which focused on an essential characteristic of texts, namely the relationship between text subject and text predicate (the theoretical concept). In the second stage, the children attempted to ask questions themselves, and in the third stage they were given the entire text immediately and were told to identify places where relevant questions had to be asked (in the text a certain fact was deliberately omitted). The striking result of this experiment is that the children not only mastered the basic strategy, but even went on to discover and apply derivative strategies themselves: speculating out loud, asking a question containing a guess, anticipating and reviewing.

The children who participated in the experiment went through a number of levels which the researcher categorized as follows. At the first level, the children only asked questions about trivialities in the text. At the second level, they began to ask more relevant questions, but these were intended to help them remember the text. The real breakthrough came at the third level, when they independently from the teacher formulated questions to help them understand the text better. They also discovered derivative strategies. At the fourth level transfer occurred and the children applied the strategies they had mastered to entirely new types of text and problem situations. The children also became critical, not only with respect to their own reading, but also with respect to the text. The author reported that the 16-year-olds became particularly adept at that level, but since there is no clear quantitative evidence supporting this

observation, the protocol material will have to suffice. The conclusion is that the training discussed here stimulated and allowed the children to learn to reflect on the way in which they read and studied texts.

Another study in line with Dawydov's school was conducted by Malzewa (1974) under El'konin's supervision. Like Doblaev, Malzewa intended to conduct a development educational study exploring how children might be stimulated to achieve a higher level of textual understanding. Her participants were children about eight years of age. Malzewa believed that the children would understand texts better if they were capable of monitoring their own reading activity. They would be better able to monitor their own activity if they could master a systematic approach allowing them to reflect on that approach. Malzewa taught the children to structure a text, an approach consisting of three different activities. First, she taught the children to identify the main theme of the text. Like Doblaev, Malzewa believed that it was possible to identify the main theme (the essence) of a text by analyzing the relationship between the subject and the predicate. Second, she had the children summarize the text, and third, she taught them to split it up into relevant sections. Training commenced by showing the children that they could structure a text using questions (Who is the story about? What are they doing?). The children next learned what summarizing was, i.e. identifying cohesive sections of text. How does one go about doing that? All of these various processes taught the children to reflect by means of three questions: 1. What am I doing right now? 2. What have I done? 3. What remains for me to do? Gradually

a model developed and the children patterned their own activities on this general (theoretical) model according to which a text should be structured. In Dawydov's terms, the children mastered a theoretical way of thinking.

Personal and intellectual reflection

The next group of researchers to be discussed here have investigated reflection, in particular during problem-solving, in relation to personality traits (Stepanov & Semenov, 1982; Zarecky & Semenov, 1980; Semenov & Stepanov, 1985). These researchers make a distinction between intellectual and personal reflection and base this distinction on studies on reflection in university students. Intellectual reflection involves concentrating on the objective data of a problem, i.e. the contents of the problem. People ask themselves questions such as: What type of problem is it? What do I know about it? How should I tackle it? The person engaged in personal reflection, on the other hand, attributes meaning to his own actions during the search process. Instances of positive and negative self-evaluation play a role in this process and have an unmistakable impact on the solution process itself.

Stepanov and Semenov (1982) conducted an experiment which demonstrated that the personal component of reflection can be reinforced by the instruction "Try to solve the problem out loud while observing yourself". The first, observational, series in the experiment was set up in such a way that the researcher did not exercise any influence whatsoever, merely instructing the participants to "Solve the problem while thinking out loud. You have three minutes for each problem". In the second, developmental

series, an attempt was made to teach the participants to form a conscious representation of their own individual aptitude and approach. The instructions were now as follows: "Try to solve the problems within three minutes, and formulate your thoughts out loud. Remember that when you are solving problems creatively, the first solution you think of is usually not the correct one. If you believe that your answer is correct, try to put the solution principle into words. You will then be told whether or not the answer is correct."

These instructions were repeated for each problem that the participants (18 - to 24-year-olds) were asked to solve. The experiment showed that the participants became more aware of the difficulties which they might run across when solving a problem. The researchers identified three forms of personal reflection: the situational, the retrospective and the perspective. Situational reflection permits the participant to become more aware of his own actions and to attribute meaning to them. This is particularly the case when there is a risk that the search process might become blocked. When situational reflection proves inadequate, however, the participant will begin to review his own actions in order to track down the cause of the stagnation. In a conflict situation, however, it also becomes important to generate new plans and perspectives.

The researchers have also identified three forms of intellectual reflection: the extensive, the intensive and the constructive. The participants engaged in extensive reflection only reported on their actions; those engaged in intensive and above all constructive reflection actively intervened in and

transformed their own actions.

Finally, this classification has led this group of researchers to distinguish between productive and reproductive reflection. Productive reflection is characterized by a high (constructive) level of intellectual reflection and a high (perspective) level of personal reflection. According to the researchers, personal reflection plays a dominant role because the process of searching for perspectives forces the participant to concentrate on his future actions. The subject hence becomes capable of construction and in particular is able to modify and transform his own actions. Without personal (perspective) reflection, intellectual (constructive) reflection becomes difficult to achieve. Reproductive reflection consists of an extensive, but at times also intensive, form of intellectual reflection and (typically) of a situational form of personal reflection. Personal reflection now plays a subordinate role, self-monitoring is weaker and the subject is only partly aware of his own action. He is more inclined to report his actions rather than to analyze them and improve them when necessary (compare Zak's (1980) empirical thinkers, who only reported placing the strips alongside one another). Those capable of reproductive reflection monitor their actions, sometimes in depth and sometimes superficially.

Stepanov and Semenov (1985) recommend training children to attribute meaning to their own actions, a characteristic of personal reflection. This can take place in various different phases. The first phase consists of updating the existing meaning structure. The second consists of choosing and using these

structures in order to test stereotypes. In the third phase the same stereotypes are brought into discredit by challenging them in a conflict situation. In the fourth phase, new action principles and new meanings are formulated.

Stepanov and Semenov (1985) illustrated these phases by means of the following example. A person is given a problem and instructions for solving this problem. He soon discovers, however, that the instructions do not match the problem very well. A conflict has now arisen forcing the person to select a different strategy, as the first has become invalid. He must hence reject the instructions he has been given and engage in self-instruction. Stepanov and Semenov's (1985) reflection theory can be summarized as follows (see TABLE 1).

INSERT TABLE 1 ABOUT HERE

Reflection, self-evaluation and self-monitoring

The discussion now turns to another group of researchers belonging to the cultural-historical school who have concentrated above all on the relationship between attribution and reflection processes. Bozmanova and Sacharova (1982) have focused on the idea of the regulating function of reflection. Such regulation is influenced by monitoring and self-evaluation. To a large extent they view self-evaluation as a personality trait. In one of their experiments, they investigated the following regulative functions of reflection (considered indicators of reflection): 1. The way in which a problem is analyzed. 2. The way in which solution hypotheses are modified. 3. The way in which the subject searches

for steps in the solution process.

Their protocol analyses demonstrated that the higher the level of reflection, the more careful children were in assessing their own ability and the difficulty of the problem. They were somewhat reluctant and only rarely underestimated the difficulty of the problem they were to solve. This attitude regulated their actions and their approach to problem-solving. These children were able to evaluate the difficulty of the problem and their own abilities adequately. They were also inventive when it came to anticipating probable solutions: "Let's see what happens if I do it this way."

The lower the level of reflection, on the other hand, the more certain the children were of their own abilities and the more they were inclined to underestimate the difficulty of the problem. Children who did not reflect at all (i.e. were unable to transform hypotheses or seek out steps in the solution process) were ultimately unable to solve the problems which they had previously judged to be easy. Neither their assessment of the problems nor their self-evaluation were adequate.

Other authors have also pointed out the connection between reflection (monitoring) and self-evaluation (Abramova, 1982; Polivanova, 1978; Sacharova, 1982). Sacharova distinguishes between self-monitoring and self-evaluation. Self-monitoring occurs when a person reviews whether his actions have been performed correctly. Self-monitoring leads to "self-regulation". According to Sacharova (1982), self-evaluation means that the person questions whether the actions performed were in fact adequate for the problem at hand. She identifies three forms of monitoring: a. prognostic monitoring (a mental assessment of a

selection from among various approaches) b. monitoring during the solution process c. monitoring, evaluation of the result of the action. Sacharova also identifies three forms of self-evaluation: a. prognostic ("Can I solve the problem adequately? How should I go about doing so? What do I need to know? What do I know already?" and so on) b. evaluation of the actions ("How adequate are the actions given the goal that I am striving to achieve?") c. retrospective self-evaluation (cf. Slobodcikov & Cukerman, 1990).

The work of these researchers (Abramova, 1982; Polivanova, 1978; Sacharova, 1982) hence centers on the relationship between reflection (especially monitoring) processes and processes of attribution (self-evaluation). In other words, "the assessment of the task difficulty and of one's own ability to perform the task" (Bozmanova & Sacharova, 1982, p. 234).

A related, interesting piece of research was reported by Gorny (1977), who determined experimentally that good problem-solvers monitored themselves more frequently and effectively. As the problems in the experiment became more difficult, these children monitored themselves more closely. However, their excellent performance cannot be attributed exclusively to self-monitoring. In fact, these children often did not monitor themselves at all in instances when they were absolutely certain that they were right. Gorny calls this attitude "Selbstsicherheit" (self-assurance).

The final researchers in this group to be discussed here are Matis, Polivanova, Slobodcikov and Cukerman. Matis (1982) distinguishes between self-monitoring and the monitoring of

another person. She has studied the relationship between interaction (discussion) and reflection using the following experimental design. The children involved in the study were given various tasks to perform and told to perform a common result. That would only be possible if they consulted one another, but they were also instructed to continue individually with what another child had already begun. The tasks consisted of writing texts and checking each other's work methods and texts. The experiment showed that the quality of the reciprocal monitoring had increased because the children had learned to apply the tools needed to elaborate this monitoring. A more striking research result, however, was that self-monitoring (reflection) also improved. The explanation for this result is that the children had learned to evaluate their own actions from the perspective of another. The observations revealed that their self-monitoring consisted of inserting corrections in their own texts and of evaluating the design and activity of writing texts. The children spontaneously began to compare their own approach to those of the other children.

It will be clear that reflection can be seen as internalized dialogue. According to Matis (1982), interaction allows children to develop the skill of "evaluating their own work from the perspective of another" (p. 283). These conclusions reinforce the research results achieved by Polivanova (1978), who argued for process-oriented monitoring instead of results monitoring, and who advocated anticipatory monitoring in particular. Like the others, this researcher considers interaction as an important stimulus for self-monitoring. This is a characteristically

Vygotskian point of view which has also been defended by Slobodcikov and Cukerman (1990), although the latter two authors emphasize that reflection offers the important psychological advantage of improving the child's skill at "self-determination", making him better at testing different approaches in new situations and confident enough to actually do so.

Concluding Remarks

The present article will conclude with a discussion of the following points: first, the type of research which is conducted in Russia; second, the significance of the philosophical and theoretical background upon which the researchers have based their work; and finally, the core issues of the studies referred to and any possible connections between them.

Research

The majority of research studies on reflection can be described as qualitative. Researchers do not work with a large population of participants and use very basic statistical analysis techniques, when they use them at all. They often go no further than calculating percentages. They focus primarily on process research, attempting to show how mental processes emerge, the quality of these processes and how this quality can be improved. In his publications, Dawydov continuously emphasizes that his research center is concerned with the cognitive opportunities of children. That is why the studies are designed as "development educational research"; the object is to find out how "new qualitative abilities" can arise, as Vygotsky (1964) put it. The advantage of this approach is that it provides a good impression of the mental processes which are central to the

research. It allows us to become acquainted with psychological analyses which offer an unambiguous understanding of the intended reflective processes.

What this approach lacks, however -- at least by Western standards -- are quantitative analyses and very often the required methodological underpinnings. These are necessary to arrive at an interpretation of the research results and to evaluate whether training has in fact been successful, even among larger populations (Tomic, Kingma & TenVergert, (1993). The quantitative data are not sufficiently convincing, although the qualitative analyses provide some degree of balance.

Theory

As discussed above, most of the studies were set up within an obvious philosophical and scientific framework, i.e. the cultural-historical tradition. This has both advantages and disadvantages. One advantage is perhaps that this approach prevents the rise of a profusion of "schools" with, inevitably, an equally -- or excessively -- profuse number of subtheories that seem to have little in common with one another. Another related advantage is that scientific terminology is not beset by constant new variations, even contradictions. Sternberg (1985) criticized this trend as follows: "A reader interested in piecing together what is meant by metacognition might have great trouble doing so on the basis of the multiplicity of meanings presented in this chapter. I certainly did" (p. 33). Alongside Sternberg's ten, we counted twenty-five different definitions of the concept of metacognition (Nelissen, 1987). The theoretical, cultural-historical roots have safeguarded Russian reflection psychology

against uncontrolled growth, and that is certainly an advantage.

We cannot, however, close our eyes to the dangers presented by the dominance of a single overruling theory. First of all, rival theories are given little or no room to evolve. That means that the requisite criticism and discussion -- against which the theory must attempt to defend itself, thereby gaining authority and conviction -- never takes place. Second, a dominant theory can have the effect of a straightjacket or at least come across as such. It must be said that we heard almost nothing to that effect during our visits to the Academy of Sciences in Moscow, but that does not eliminate the danger.

On the other hand, the scholars are not forced to continuously defend their work against (sometimes rather irrelevant) attacks. All efforts are focused on "building the school"; researchers can concentrate on working out their own paradigms and ultimately acquire the necessary eloquence.

Learning to reflect

As noted above, a major share of the research conducted by Russian psychologists has focused on stimulating cognitive development. They are not satisfied with evaluative or confirmative research; their interest lies in the "zone of proximal development", to quote a much-cited Vygotskian statement. In other words, they want above all to conduct "development educational research": their reasoning is that if you want to know how children reflect, then you have to teach them how to reflect.

How is reflection stimulated in children? What can we learn from research? The fact that we can learn anything at all useful

for everyday practice is largely due to the fact that much of the research was not conducted in laboratories but in the real world of the classroom. For example, Moscow School No. 91 was made famous as an experimental school by Dawydov's research team. This increases the ecological validity of the studies, because the experiments are always conducted in concrete practice and not in an empirical situation artificially created by the experimenters.

Below is a brief summary of the research results which have the most relevance to everyday practice. To begin, reflection seems to be stimulated by interactive education, and that in two different ways. In the first place, children learn through dialogue to anticipate the comments of another, so that the dialogue with the other becomes a dialogue with oneself (Matis, 1982; Polivanova, 1978). Second, an interesting experiment conducted by Ajdarova et al. (1983) demonstrated that by changing roles during "dramatizations", children learned to see things through the eyes of another. If a child first played a scenario writer and then an actor, it learned to view its actions as an actor from the perspective of the scenario writer. It therefore learned to see itself as others saw it.

Learning "theoretical" concepts -- one can also speak of learning to think mathematically, linguistically, etc. -- appears to give reflection an added impulse, because the thought processes as such are reflective (Zak, 1984; Dawydov, 1972) and because this approach to conceptualization arouses children's interest in their own thinking. Models and diagrams -- and the <u>construction</u> of these things -- are important representational forms which the act of reflection can focus upon. It would be

advisable to develop curricula based on these principles.

Doblaev (1984) demonstrated that children should not just be given texts to read, but that the use of certain strategies can increase their understanding of texts. His students were capable of learning new strategies spontaneously and of reflecting critically on their own reading behavior.

Self-monitoring can be stimulated in a variety of ways. The first is by knowing precisely what one must monitor and by learning to work systematically according to an activity model (Malzewa, 1974). Second, self-monitoring is related to self-evaluation (Abramova, 1982; Polivanova, 1978; Sacharova, 1982). Educational practice does not devote much attention to nurturing an adequate capacity for self-evaluation in the child (adequate self-image), even though it is an important prerequisite for reflection.

Stepanov and Semenov (1982) emphasized in their research that the personal "perspective" form of reflection serves to regulate action. Also important is the theory put forward by these researchers that the learning and thinking process must have meaning for children. After all, it is only when action is meaningful that it makes sense to reflect on it. Reflection can be stimulated by placing children in a conflict situation and by making them aware of the thought processes which are invoked.

The research findings given above can, almost without exception, be regarded as practical guidelines for everyday educational practice.

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Note:

1. As far as we are aware, Lenin did not refer to the psychological "reflective" theory in his work (in the sense of "deliberative"), but instead to the Marxist variant of the correspondence theory, i.e. the "reflexive theory"; the concept of "mirroring" probably comes the closest. English does not distinguish between "reflection" and reflexion", even though the two terms could be used to express the difference between the psychological and the epistemological theory (after all, we do not "reflex", but "reflect"). In Dutch and German, on the other hand, there are separate terms: "weerspiegeling" / "reflectie" and "Wiederspieglung" / "Reflexion" respectively. Czech uses "odraz" (reflection or reality in consciousness) to refer to "Wiederspieglung", and "reflexe" to refer to "Reflexion". In French the term "réfexion" is used to refer to both theories. Piaget speaks of reflection -- in his view the "moteur du développement cognitive" (Piaget, 1977, p. 307) -- in different terms, for example réflexion, réfléchissement, metaréflections.

Figure Captures

1. Zak's ideas on reflection
2. Diagram of a communication situation